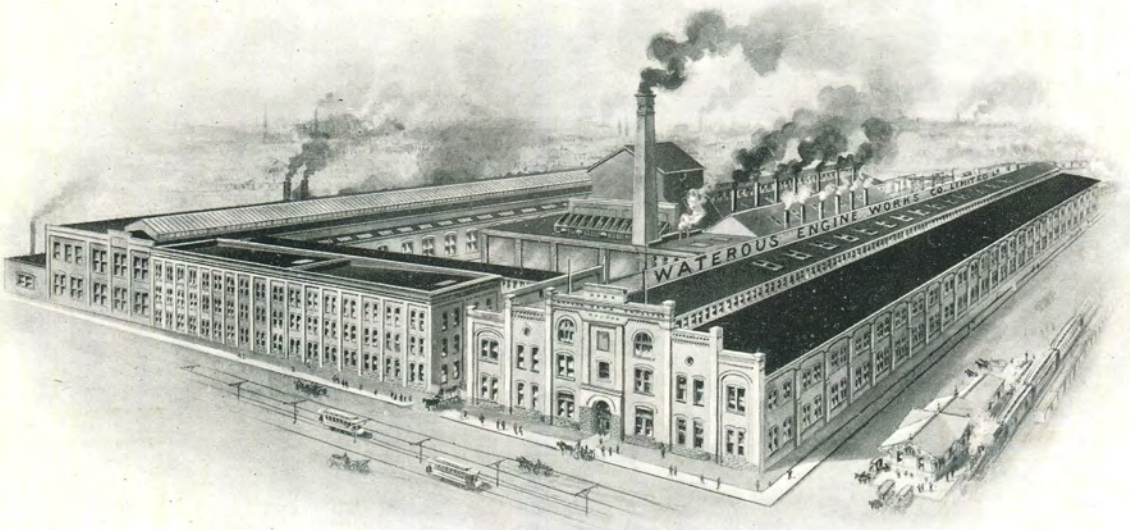
H.R.T. BOILERS

CATALOGUE 5061

THE

WATEROUS ENGINE WORKS
COMPANY, LIMITED

Brantford, - - Canada



WORKS AND MAIN OFFICE

BRANTFORD, ONT., CANADA

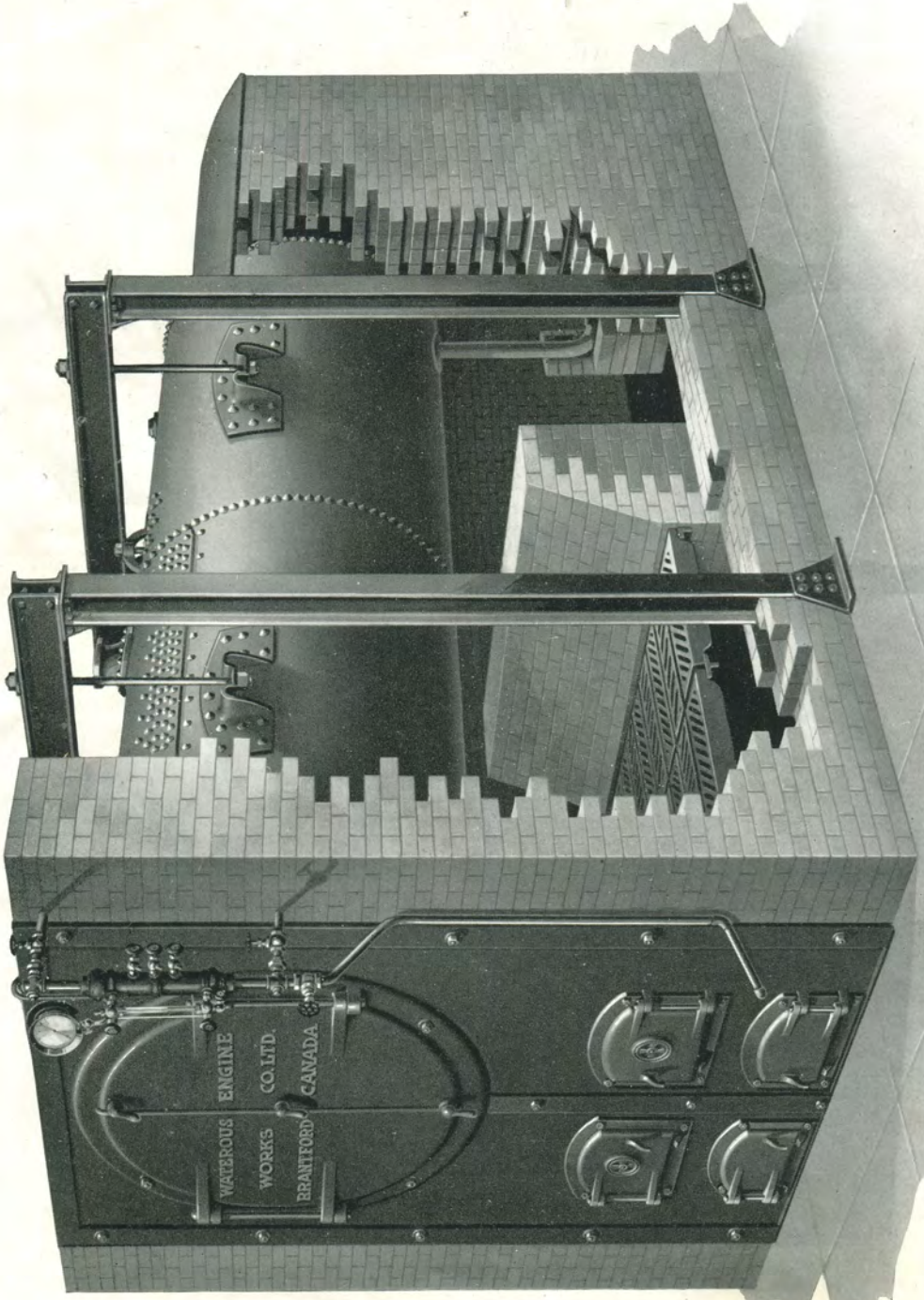
ESTABLISHED 1844

WINNIPEG, Man.

Molsons Bank Bldg.,
VANCOUVER, B.C.

London Representative:

W. A. FAULKNER
124 CHANCERY LANE,
LONDON, W. C. 2



STANDARD SETTING FOR ONTARIO—FULL FLUSH FRONT

For Boilers 16 ft. and over. Boilers 14 ft. long are suspended at back end only, and boilers 12 ft. long and under have brackets resting on side walls at both ends.

WATEROUS RETURN TUBULAR BOILERS

IN designing our line of Return Tubular Boiler we have had in view the building of the best boiler of this type that could be produced with the aid of modern machinery, skilled workmanship and a thorough knowledge of the requirements of the consuming public.

It is unnecessary to go into lengthy details as to the design, efficiency and durability of the Return Tubular Boiler. Every Steam user is fully acquainted with this type of boiler as it is the most widely used of all boilers on the Western Hemisphere.

We build this type of boiler in sizes ranging from 25 to 165 H.P. We are staunch advocates of the installation of the larger sizes of return tubular boilers, the initial cost both of the boiler and the setting is less than two or more small boilers of a given capacity.

It should be understood that we design our boiler settings to suit the particular needs of each customer, giving particular attention to the kind of fuel that is to be used. Our customers have the assurance that they are getting a boiler that will attain the highest degree of economy. One that will meet his exact needs. There are important details in the construction of a boiler setting—the type of furnace, draft conditions, etc., that are necessary for the successful operation of a boiler. All these requirements are thoroughly gone into by our engineering department and the result is our boilers give better service and are operated more economically than others.

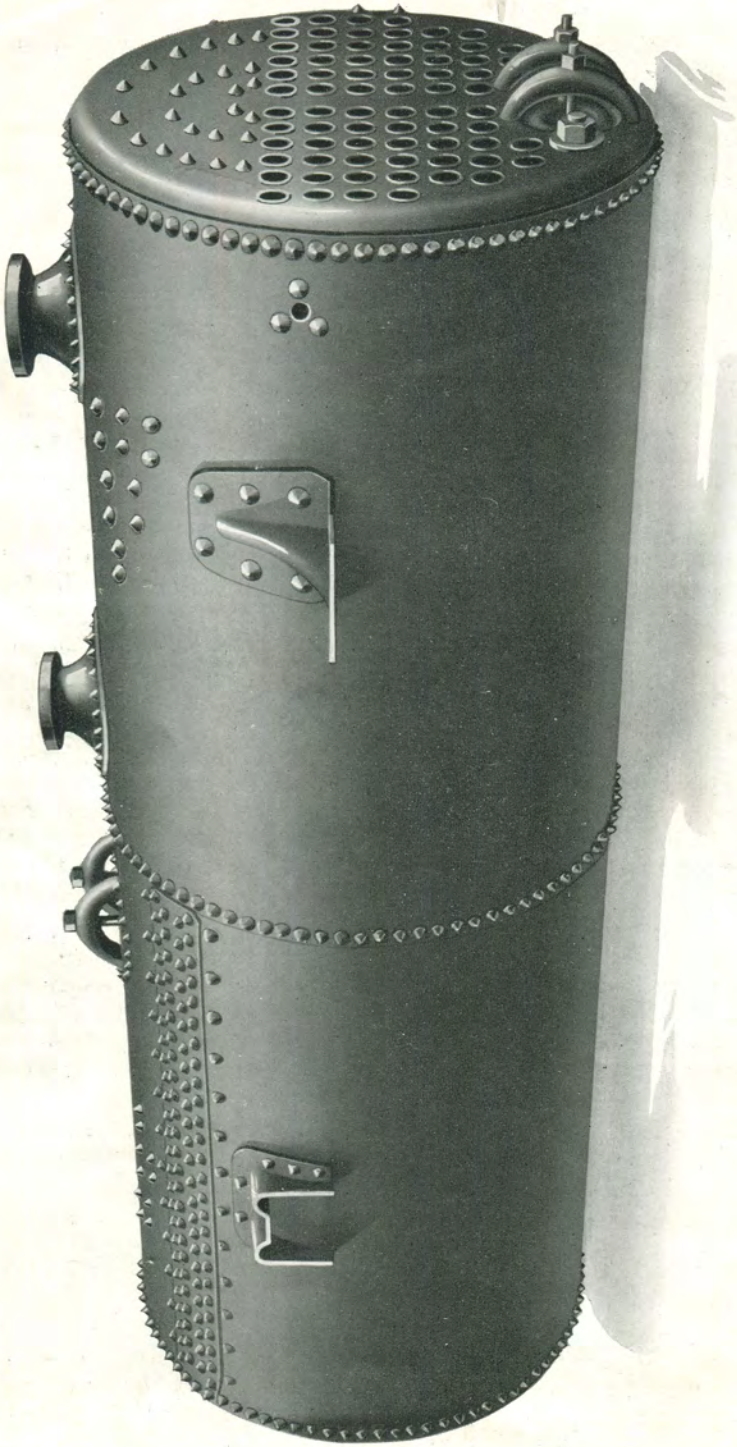
SPECIFICATION

Materials. All materials used are the best of their respective kind. Steel plates and heads are of the best quality open hearth flange steel, having tensile strength of fifty-five to sixty-five thousand pounds per square inch. Plates of higher tensile strength not being suitable for externally fire boilers. Tubes are of best quality mild steel, lap welded, and soft enough to bend over without cracking. Rivets are of mild steel to conform to standard specifications for tensile strength and durability. Stay rods are of round steel of approved quality, forged in one piece without weld.

Design. The Shell of the boiler is made in two courses, one plate to a course. The longitudinal seam in every case—both in 125 and 150 lb. boilers—is of the butt joint type, triple riveted. Circumferential seams are single riveted. The riveted seams are carefully proportioned to secure the strongest practical joint for the pressure they are to bear, and sufficient margin of plate is left to secure an accurate caulking edge and a tight joint.

The tubes are set in vertical and horizontal rows with wide vertical centre row, and arranged to give ample space for water circulation and large steam space above the water line.

The heads are thoroughly braced both above and below the tube section. Above the tubes, solid weldless steel braces extend diagonally from the heads far back upon the shell; below the tubes, the heads are braced by two through-going stays. These are fastened to the front head by inside and outside nut and steel washer, but at the back, where the hot gases would corrode the nuts, they are attached to a steel anchoring plate and fastened to the inside of head by screwed stay bolts riveted to shell.



STANDARD BOILER FOR ONTARIO 14 FT. LONG

With Hangers at back and Brackets at front. Boilers shorter than 14 ft. have Brackets both front and back.

SPECIFICATION—Continued

Boilers 48 in. and larger in diameter have one manhole in front head below the tubes as well as one in top of shell, each provided with bridge, bolt and cover of approved design. Manhole in head is flanged from the solid head under hydraulic pressure and is heavily reinforced by a shrunk-on steel ring; the upper manhole consists of thick steel plate flanged to shape, reinforced by shrunk-on ring, and riveted to inside of shell.

Steam Outlet placed in front shell near centre of boiler is fitted with forged steel flanged nozzle riveted to shell. A wide mouthed bell deflector attached inside the boiler below the steam outlet ensures the delivery of dry steam.

Blow-Off is taken from the bottom of boiler near the rear head, the shell strongly reinforced with extra thickness of steel plate where it attaches. Blow-off pipe is made heavy and extended to clear rear brick work. A wrought iron protection sleeve covers the section of the blow-off pipe that extends through the brick work.

The arrangement of brackets and hangers varies according to the size of boiler. We have adopted the form of pressed steel hanger shown on page six, and supply them in two sizes. The larger size is used on all boilers 66 in. in diameter and over, the smaller hanger is used with boilers 48 to 60 in. diameter, 14 ft. long, with a pressed steel bracket in front. (See page 4.) Boilers below this length have brackets in front and rear.

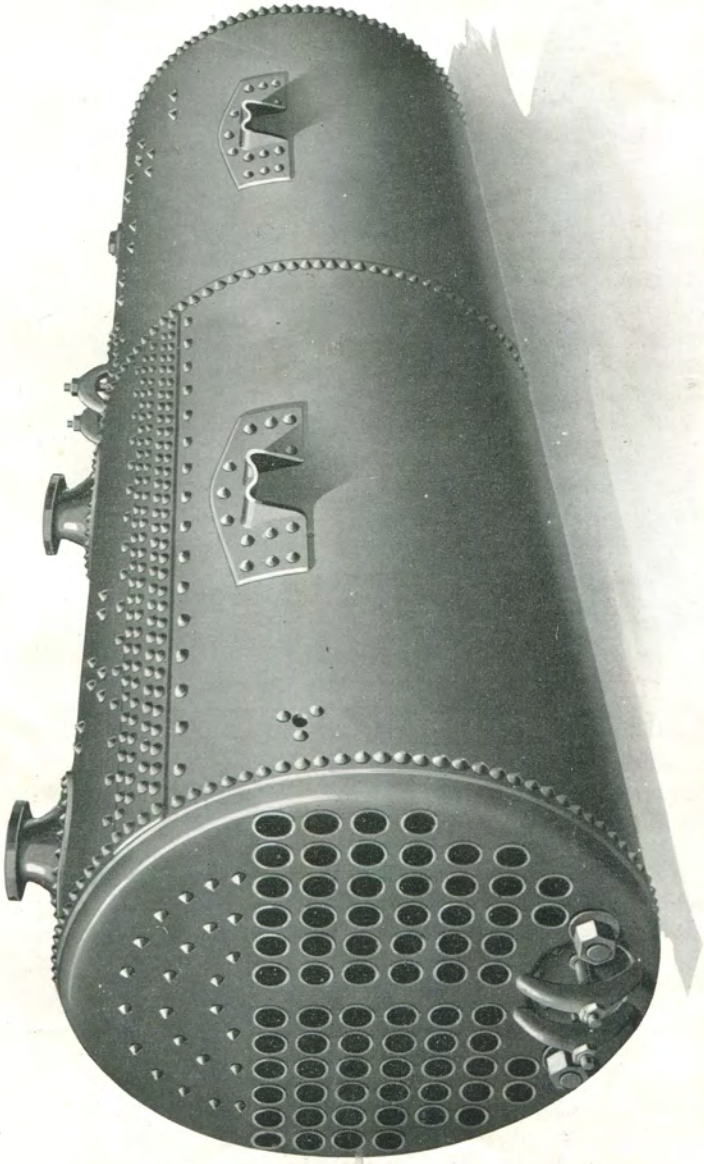
Workmanship. The Shell Plates are planed on edges to size after shearing. They are then formed to a perfect circle in the bending rolls. Heads are heated uniformly in special furnace, are flanged in one heat under hydraulic pressure to exact size and without cracks. They are accurately bored—not punched—for tubes. All rivet holes are punched small and reamed to exact size after plates are assembled. Any ragged edges and burrs are removed from around holes so that plates come close together. All caulking is done with pneumatic machine and round nosed tool. Tubes are made a tight fit in heads, are without ferrules and are expanded with sectional expander and beaded over at both ends with pneumatic machine.

Fittings. Supplied with every Waterous Return Tubular Boiler are: Full front cast iron water column with three try cocks and water gauge, steam gauge with syphon, pop safety valve, blow-off cock, feed water pipe with check and cut-off valves, grates (of specified type), grate bearers, dead plate, up-take with damper, rear cleaning-out door with frame and anchor bolts, castings for rear arch, poker, scraper, slice bar, and flue cleaner.

Inspection. All our boilers are built under Government inspection. The plates are carefully checked by the Government inspector for thickness, etc., before work is commenced.

When the plates are rolled and assembled for riveting a second inspection is made by the Government inspector for the purpose of examining the fitting of the plates, heads, stays, etc., and to make sure that all holes are accurately in line.

Before the boiler leaves our shop it is subjected to a third examination when a hydrastatic pressure of 50% greater than the marking pressure is applied. The boiler must be absolutely tight under this pressure before the Government inspector will affix his stamp, and no boiler is permitted to leave the factory without this stamp.



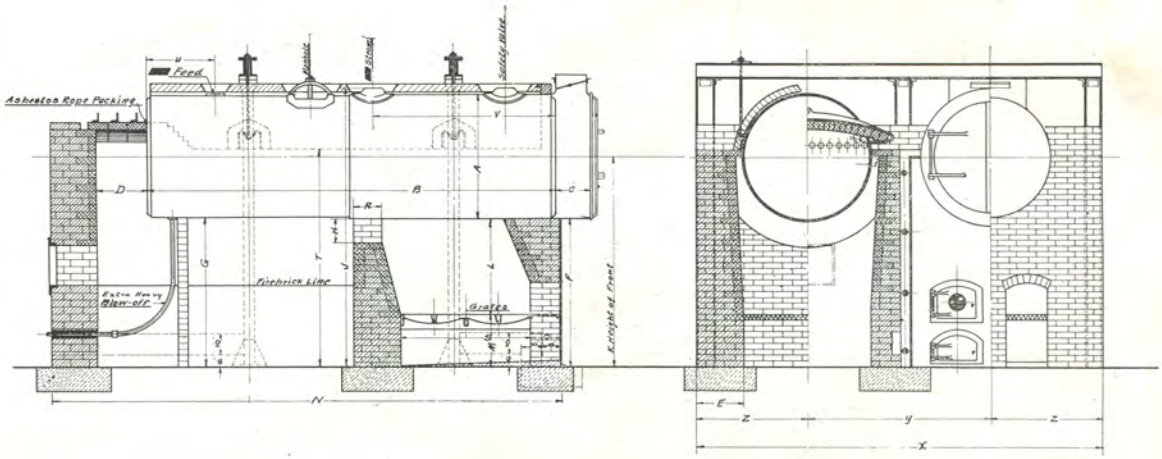
STANDARD BOILER 72 in. x 18 ft.

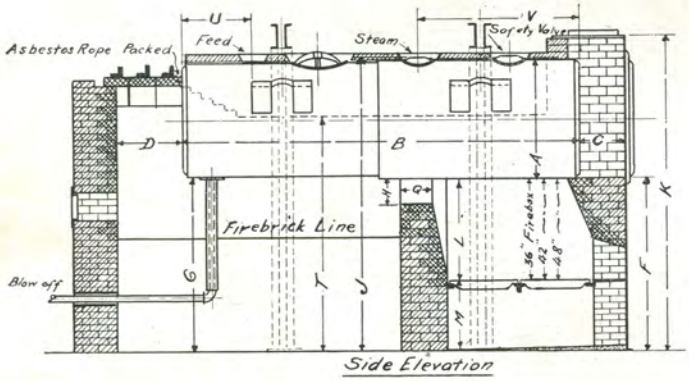
Built in accordance with Interprovincial Boiler Laws.
Boilers 16 ft. long and over are suspended at both ends.
Boilers 14 ft. long are suspended at back end only.
Boilers less than 14 ft. long have brackets both front and back.

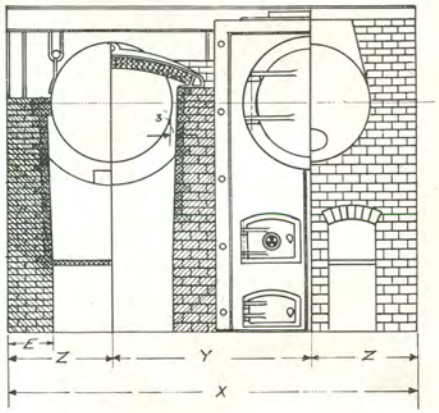
TABLE OF DIMENSIONS, CODE WORDS, AND APPROXIMATE WEIGHTS

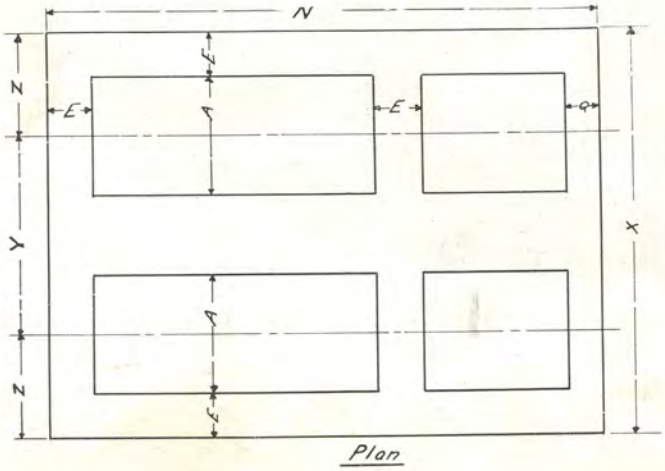
Horse Power		25	30	30	35	40	40	50	55	60	65	70	80	90	100	110	120	135	150	165
Code word, 125 lbs. pressure (Idcacem)		bab	bec	bid	bof	bug	byh	cac	ced	cif	cog	cuh	cyj	dad	def	dig	doh	duj	dyk	faf
Code word, 150 lbs. pressure (Idcacem)								gag	geh	gij	gok	gul	gym	hah	hyj	hik	hol	hum	hyn	ja
Diameter of boiler (in.)		36″	36″	42″	42″	42″	48″	48″	48″	54″	54″	60″	60″	60″	66″	66″	72″	72″	72″	72″
Length of boiler (ft.)		10′	12′	10′	12′	14′	10′	12′	14′	12′	14′	12′	14′	16′	14′	16′	14′	16′	18′	20′
No. of tubes ° Standard No. in stock boilers	3″	°32	°32	°38	°38	°38	°44	°44	°44	°56	°56	°70	°70	70	°92	92	°108	108	108	108
	3½″									44	44	54	54	°54	72	°72	90	°90	90	90
	4″											52	52	52	56	56	72	72	°72	°72
Total Heating Surface sq. ft.	3″ tube	312	363	360	433	501	418	499	581	628	731	771	897	1023	1155	1317	1345	1534	1723	1912
	3½″ tube						330	394	458	585	680	706	821	936	1068	1218	1314	1498	1682	1866
	4″ tube											765	889	1014	993	1133	1214	1383	1553	1723
Standard Coal Grates, Style A	Width in.	31	32½	36	38	38	41	43	43	48½	48½	53½	56	56	61	61	66	66	66	64
	Length in.	43	49	43	49	49	43	49	49	49	49	49	54	61½	54	61½	54	61½	66	73
	Area sq. ft.	9.2	11.0	10.7	12.9	12.9	12.2	14.6	14.6	16.5	16.5	18.2	21.0	23.9	22.9	26.1	24.7	28.1	30.2	32.4
Diameter of Stack (1 boiler)		18	18	20	20	20	22	22	22	24	24	26	26	26	30	30	34	34	34	34
Diameter Steam Outlet		2½	2½	3	3	3	3½	3½	3½	4	4	4	4	4	5	5	5	5	5	5
Feedwater Conn., Ont., Alta., Sask.		1	1	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1½	1½	2	2	2	2
Diameter of blow-off connection		1½	1½	1½	1½	1½	1½	1½	1½	2	2	2	2	2	2	2	2	2	2	2
Feedwater connection, B.C., O.P.		1	1	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1½	1½	1½	1½	1½	1½
Safety Valve Nozzle	Steel	2½	2½	2½	2½	2½	3½	3½	3½	3½	3½	4	4	4	4	4	°4½	°4½	4½	4½
Weight of boiler with fixtures	125 lbs. pressure	4850	5400	6250	6900	7000	8150	8900	9650	10700	11500	12750	14000	15250	17000	18600	20000	22000	24000	26000
	150 lbs. pressure							9100	9900	11000	12000	13300	14650	16000	18000	19600	21150	23150	25150	27150
Weight of bare boiler	125 lbs. pressure	2900	3300	3750	4250	4770	4900	5600	6300	6950	7650	8700	9775	10850	12250	13500	14700	16400	18300	20200
	150 lbs. pressure							6000	6800	7600	8400	9400	10600	11800	13200	14700	15850	17800	19750	21700

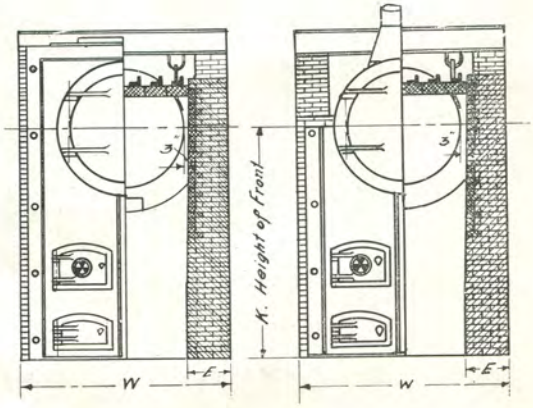
NOTE.—In using code word of boilers use prefix "Idcacem" and add necessary syllable to complete word—i.e., 25 h.p. boiler—Idcacembab.


Feed
Asbestos Rope Packing
Firebrick Line
Grates
Extra Heavy Blow-off
K. Height of Front
N
E
Z
Y
X


U
V
Feed
Steam
Safety Valve
Asbestos Rope Packed
Firebrick Line
Blow off
56" Firebox
42"
48"
Side Elevation


E
Z
Y
Z
X


N
E
A
Z
Y
X
Plan


K. Height of Front
W
E

DIMENSIONS FOR SETTING H.R.T. BOILERS

	For Single and Double Settings																		Single setting only	Double			Single setting only					x Add for each ex. setg.	
																							Fire brick	Common brick	No. 1 arch fire brick				
																									Rear arches	Rear arches BConly	Fire doors	Fire brick	Common brick
HP	A "	B '	C "	D "	E "	F "	G "	H "	J ' "	K ' "	L "	M "	N ' "	Q "	R "	T ' "	U "	V ' "	W ' "	X ' "	Y ' "	Z ' "							
25	36	10	12	20	13½	52	51	8	7– 9	7– 9½	25½	26½	13– 9½	9		5–10	21¼	3–11½	5–3	10–3	5–0	2– 7½	825	4300	30	60	13	825	2580
30	36	12	12	20	13½	52	51	8	7– 9	7– 9½	25½	26½	15– 9½	9		5–10	27¼	4–11½	5–3	10–3	5–0	2– 7½	850	4500	30	60	13	850	2700
30	42	10	14	20	18	58	57	10	8– 9	9– 2½	36" Std. We have front patterns for 42" and 48" height furnaces if desired	22	14– 4	13½		6–10	21¼	3–11½	6–6	12–0	5–6	3– 3	1050	5800	21	75	18	1050	3480
35	42	12	14	20	18	58	57	10	8– 9	9– 2½		22	16– 4	13½		6–10	27¼	4–11½	6–6	12–0	5–6	3– 3	1200	7700	21	75	18	1200	4620
40	42	14	14	20	18	58	57	10	8– 9	9– 2½		22	18– 4	13½		6–10	33¼	5–11½	6–6	12–0	5–6	3– 3	1320	8500	21	75	18	1320	5100
40	48	10	16	24	18	58	57	10	9– 4	9– 5½		22	14–10	13½		7– 1	21¾	3–11½	7–0	13–6	6–6	3– 6	1170	7400	21	102	18	1170	4440
50	48	12	16	24	18	58	57	10	9– 4	9– 5½		22	16–10	13½		7– 1	27¼	4–11½	7–0	13–6	6–6	3– 6	1300	8700	21	102	18	1300	5220
55	48	14	16	24	18	58	57	10	9– 4	9– 5½		22	18–10	13½		7– 1	33¾	5–11½	7–0	13–6	6–6	3– 6	1470	9600	21	102	18	1470	5760
60	54	12	16	24	18	58	57	10	9–10	9–11½		22	16–10	13½		7– 5	27¼	4–11½	7–6	14–0	6–6	3– 9	1460	9050	24	102	18	1460	5430
65	54	14	16	24	18	58	57	10	9–10	9–11½		22	18–10	13½		7– 5	33¼	5–11½	7–6	14–0	6–6	3– 9	1580	9900	24	102	18	1580	5950
70	60	12	16	24	22½	60	59	12	10– 6	10– 9¾		24	17– 2½	13½		7– 9	27¼	4–11½	8–9	16–0	7–3	4– 4½	1610	11800	24	119	22	1610	7080
80	60	14	16	24	22½	60	59	12	10– 6	10– 9¾		24	19– 2½	13½		7– 9	33¼	5–11½	8–9	16–0	7–3	4– 4½	1760	12600	24	119	22	1760	7560
90	60	16	16	24	22½	60	59	12	10– 6	10– 6¾		24	21– 2½	13½		7– 9	33¼	6–11½	8–9	16–0	7–3	4– 4½	1950	14000	24	119	22	1950	8400
100	66	14	18	28	22½	61	60	12	11– 1	11– 2¾		25	19– 8½	18		8– 2	33⅜	5–11½	9–3	17–0	7–9	4– 7½	1850	14100	24	152	22	1850	8460
110	66	16	18	28	22½	61	60	12	11– 1	11– 2¾		25	21– 8½	18		8– 2	33⅜	6–11½	9–3	17–0	7–9	4– 7½	2040	15450	24	152	22	2040	9280
120	72	14	18	28	22½	61	60	12	11– 7	11– 9		25	19– 8½	18		8– 6	33⅜	5–11½	9–9	18–0	8–3	4–10½	1960	14700	24	152	26	1960	8820
135	72	16	18	28	22½	61	60	12	11– 7	11– 9		25	21– 8½	18		8– 6	33⅜	6–11½	9–9	18–0	8–3	4–10½	2160	15650	24	152	26	2160	9400
150	72	18	18	28	22½	61	60	12	11– 7	11– 9		25	23– 8½	18		8– 6	33⅜	7–11½	9–9	18–0	8–3	4–10½	2360	16800	24	152	26	2360	10080
165	72	20	18	28	22½	61	60	12	11– 7	11– 9		25	25– 8½	18		8– 6	33⅜	8–11½	9–9	18–0	8–3	4–10½	2560	17700	24	152	26	2560	10720
25	36	10	12	20	13½	36	35	8	6– 5	3–10½	17¾	18¼	12– 9½	4½	9	4– 9	21¼	3–11½	5–3	10–3	5–0	2– 7½	500	3320	30	60		500	1800
30	36	12	12	20	13½	36	35	8	6– 5	3–10½	17¾	18¼	14– 9½	4½	9	4– 9	27¼	4–11½	5–3	10–3	5–0	2– 7½	550	3400	30	60		550	1900
30	42	10	17	20	18	58	57	10	8– 9	6– 7	33" Std. We have front patterns for 42" and 48" height furnaces if desired	22	13– 2	4½	13½	6–10	21¼	3–11½	6–6	12–0	5–6	3– 3	960	5060	21	75	18	960	3390
35	42	12	17	20	18	58	57	10	8– 9	6– 7		22	15– 2	4½	13½	6–10	27¼	4–11½	6–6	12–0	5–6	3– 3	1100	6960	21	75	18	1100	4530
40	42	14	17	20	18	58	57	10	8– 9	6– 7		22	17– 2	4½	13½	6–10	33¼	5–11½	6–6	12–0	5–6	3– 3	1230	7760	21	75	18	1230	5010
40	48	10	17	24	18	58	57	10	9– 4	6– 9½		22	13– 6	4½	13½	7– 1	21¾	3–11½	7–0	13–6	6–6	3– 6	1060	6670	21	102	18	1060	4330
50	48	12	17	24	18	58	57	10	9– 4	6– 9½		22	15– 6	4½	13½	7– 1	27¼	4–11½	7–0	13–6	6–6	3– 6	1190	7970	21	102	18	1190	5110
55	48	14	17	24	18	58	57	10	9– 4	6– 9½		22	17– 6	4½	13½	7– 1	33¼	5–11½	7–0	13–6	6–6	3– 6	1360	8870	21	102	18	1360	5650
60	54	12	17	24	18	58	57	10	9–10	7– 0½		22	15– 6	9	13½	7– 5	27¼	4–11½	7–6	14–0	6–6	3– 9	1320	8280	24	102	18	1320	5290
65	54	14	17	24	18	58	57	10	9–10	7– 0½		22	17– 6	9	13½	7– 5	33¼	5–11½	7–6	14–0	6–6	3– 9	1440	9130	24	102	18	1440	5810
70	60	12	17	24	22½	60	59	12	10– 6	7– 5½		24	15–10½	9	13½	7– 9	27¼	4–11½	8–9	16–0	7–3	4– 4½	1450	10210	24	119	22	1450	6920
80	60	14	17	24	22½	60	59	12	10– 6	7– 5½		24	17–10½	9	13½	7– 9	33¼	5–11½	8–9	16–0	7–3	4– 4½	1600	11010	24	119	22	1600	7400
90	60	16	17	24	22½	60	59	12	10– 6	7– 5½		24	19–10½	9	13½	7– 9	33¼	6–11½	8–9	16–0	7–3	4– 4½	1790	12410	24	119	22	1790	8240
100	66	14	19	28	22½	61	60	12	11– 1	7– 9½		25	18– 2½	13½	18	8– 2	33⅜	5–11½	9–3	17–0	7–9	4– 7½	1680	13930	24	152	22	1680	8290
110	66	16	19	28	22½	61	60	12	11– 1	7– 9½		25	20– 2½	13½	18	8– 2	33⅜	6–11½	9–3	17–0	7–9	4– 7½	1870	15280	24	152	22	1870	9110
120	72	14	19	28	22½	61	60	12	11– 7	8– 0½		25	18– 2½	13½	18	8– 6	33⅜	5–11½	9–9	18–0	8–3	4–10½	1770	14510	24	152	26	1770	8630
135	72	16	19	28	22½	61	60	12	11– 7	8– 0½		25	20– 2½	13½	18	8– 6	33⅜	6–11½	9–9	18–0	8–3	4–10½	1970	15460	24	152	26	1970	9210
150	72	18	19	28	22½	61	60	12	11– 7	8– 0½		25	22– 2½	13½	18	8– 6	33⅜	7–11½	9–9	18–0	8–3	4–10½	2170	16610	24	152	26	2170	9890
165	72	20	19	28	22½	61	60	12	11– 7	8– 0½		25	24– 2½	13½	18	8– 6	33⅜	8–11½	9–9	18–0	8–3	4–10½	2370	17510	24	152	26	2370	10530

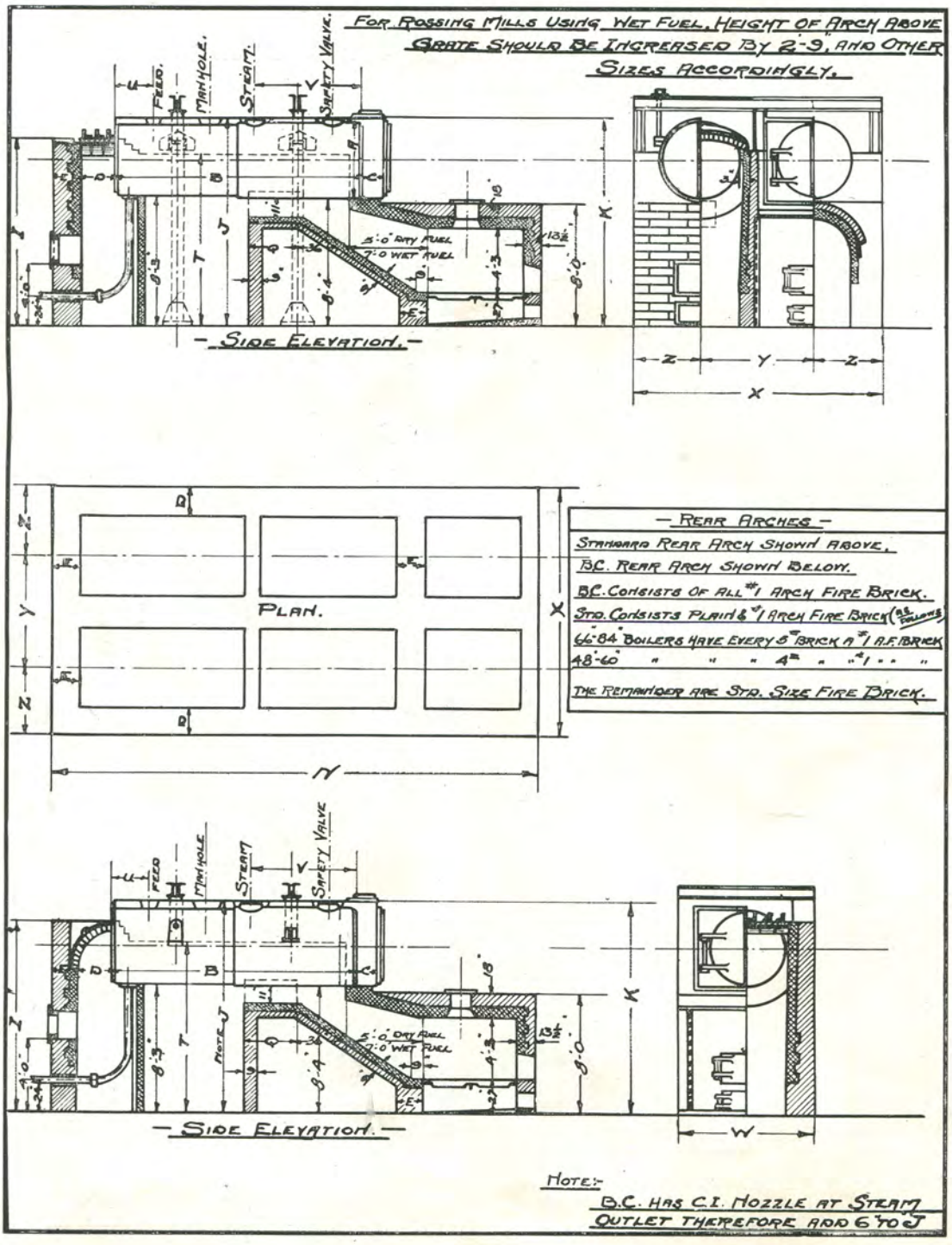
x Multiply No. 1 Arch Fire Brick by No. of boilers in battery.

FULL FRONT

HALF FRONT

WATEROUS RETURN TUBULAR BOILERS

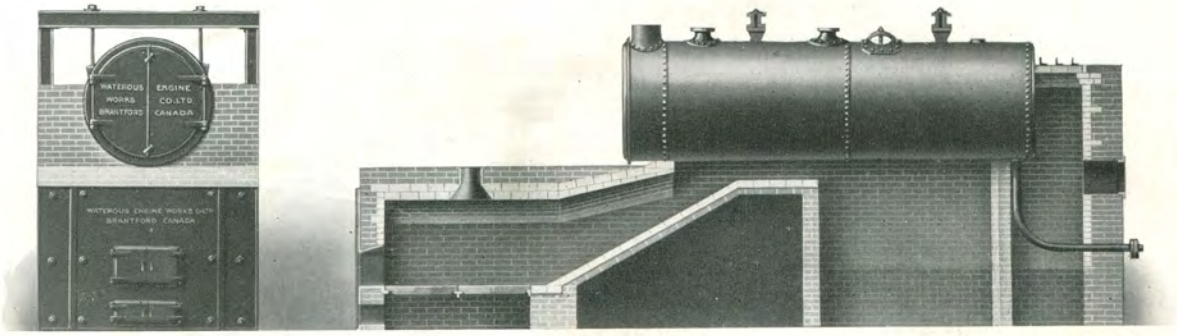
WATEROUS BRANTFORD CANADA


FOR ROSSING MILLS USING WET FUEL, HEIGHT OF ARCH ABOVE GRATE SHOULD BE INCREASED BY 2'-9, AND OTHER SIZES ACCORDINGLY.
FEED.
MAN HOLE.
STEAM.
SAFETY VALVE.
5'-0" DRY FUEL
7'-0" WET FUEL
SIDE ELEVATION.
PLAN.
REAR ARCHES
STANDARD REAR ARCH SHOWN ABOVE.
B.C. REAR ARCH SHOWN BELOW.
B.C. CONSISTS OF ALL #1 ARCH FIRE BRICK.
STD. CONSISTS PLAIN & #1 ARCH FIRE BRICK (B.S. FOLLOWS)
66"-84" BOILERS HAVE EVERY 5TH BRICK A #1 A.F. BRICK
48"-60" " " " 4TH " " #1 " " "
THE REMAINDER ARE STD. SIZE FIRE BRICK.
FEED
MAN HOLE
STEAM
SAFETY VALVE
5'-0" DRY FUEL
7'-0" WET FUEL
SIDE ELEVATION.
NOTE:-
B.C. HAS C.I. NOZZLE AT STEAM OUTLET THEREFORE ADD 6" TO J

DUTCH OVEN STD. SETTING

A	B	C	D	E	H	I	J	K	N Style of Grates C	N Style of Grates D	N Style of Grates E	O	Q	T	U	V	W	X Double setting	X Treble setting	X Quad'le setting	Y	Z	F. brick 1 setg.	C. brick 1 setg.	F. brick ex. setg.	C. brick ex. setg.	Wedge F.B. for oven d. fuel	Wedge F.B. for oven w. fuel
"	'	"	"	"	"	' "	' "	' "	' "	' "	' "	"	"	' "	"	' "	' "	' "	' "	' "	' "	' "						
48	12	16	24	18	10	11- 6	12-10	13-4	26-1½	25-7½	25-11	18	21	10- 7	27¼	4-11½	7-0	13- 6	20-0	26- 6	6-6	3-6	1500	12000	1500	7000	1000	1140
48	14	16	24	18	10	11- 6	12-10	13-4	28-1½	27-7½	27-11	18	30	10- 7	33¼	5-11½	7-0	13- 6	20-0	26- 6	6-6	3-6	1600	13500	1600	7500	1000	1140
54	12	16	24	18	10	11-10	13- 4	13-4	26-1½	26-1½	25-11	18	21	10-10	27¼	4-11½	7-6	14- 0	20-6	27- 0	6-6	3-9	1600	14000	1600	8000	1200	1340
54	14	16	24	18	10	11-10	13- 4	13-4	28-1½	28-1½	27-11	18	30	10-10	33¼	5-11½	7-6	14- 0	20-6	27- 0	6-6	3-9	1750	15500	1750	9000	1200	1340
60	12	16	24	22½	12	12- 2	13-10	13-4	27- 6	27- 6	27-6	22½	21	11-1	27¼	4-11½	8-9	16- 0	23-3	30- 6	7-3	4-4½	1900	18000	1900	10500	1400	1550
60	14	16	24	22½	12	12- 2	13-10	13-4	29- 6	29- 6	29-6	22½	30	11-1	33¼	5-11½	8-9	16- 0	23-3	30- 6	7-3	4-4½	2050	20000	2050	11500	1400	1550
60	16	16	24	22½	12	12- 2	13-10	13-4	31- 6	31- 6	31-6	22½	42	11-1	33¼	6-11½	8-9	16- 0	23-3	30- 6	7-3	4-4½	2300	22000	2300	12500	1400	1550
66	14	18	28	22½	12	12- 7	14- 4	14-3⅛	30-10	30- 7	30-1	27	30	11-5	33⅜	5-11½	10-1	17-10	25-7	33- 4	7-9	5-0½	2100	23000	2100	13000	1610	1770
66	16	18	28	22½	12	12- 7	14- 4	14-3⅛	32-10	32- 7	32-1	27	42	11-5	33⅜	6-11½	10-1	17-10	25-7	33- 4	7-9	5-0½	2400	25000	2400	14000	1610	1770
72	14	18	28	22½	12	12-10	14-10	14-9	30- 7	30-10	31-0½	27	30	11-9	33⅜	5-11½	10-7	18-10	27-1	35- 4	8-3	5-3½	2200	24000	2200	13500	1820	2000
72	16	18	28	22½	12	12-10	14-10	14-9	32- 7	32-10	33-0½	27	42	11-9	33⅜	6-11½	10-7	18-10	27-1	35- 4	8-3	5-3½	2500	26000	2500	14500	1820	2000
72	18	18	28	22½	12	12-10	14-10	14-9	34- 7	34-10	35-0½	27	48	11-9	33⅜	7-11½	10-7	18-10	27-1	35- 4	8-3	5-3½	2800	28000	2800	15500	1820	2000
72	20	18	28	22½	12	12-10	14-10	14-9	36- 7	36-10	37-0½	27	48	11-9	33⅜	8-11½	10-7	18-10	27-1	35- 4	8-3	5-3½	3100	30000	3100	16000	1820	2000
78	16	20	28	22½	12	13- 1	15- 5	15-3	32-10	32-10	33-0½	27	42	12-1	33⅜	6-11½	10-7	19- 4	28-1	36-10	8-9	5-3½	2800	29000	2800	16000	2060	2240
78	18	20	28	22½	12	13- 1	15- 5	15-3	34-10	34-10	35-0½	27	48	12-1	33⅜	7-11½	10-7	19- 4	28-1	36-10	8-9	5-3½	3150	31000	3150	17000	2060	2240
78	20	20	28	22½	12	13- 1	15- 5	15-3	36-10	36-10	37-0½	27	48	12-1	33⅜	8-11½	10-7	19- 4	28-1	36-10	8-9	5-3½	3400	33500	3400	18500	2060	2240
84	18	20	28	22½	12	13- 4	15-11	15-6	34-10	34-10	35-0½	27	48	12-5	33⅜	7-11½	10-9	20- 0	29-3	38- 6	9-3	5-4½	3300	34000	3300	19000	2300	2500
84	20	20	28	22½	12	13- 4	15-11	15-6	36-10	36-10	37-0½	27	48	12-5	33⅜	8-11½	10-9	20- 0	29-3	38- 6	9-3	5-4½	3800	37000	3800	20500	2300	2500

Above is for dry fuel length of throat being 5 ft. 0 in. Wet fuel length of throat is 7 ft. 0. in. in which case add 2000 C. brick to each boiler.



STANDARD DUTCH OVEN SETTINGS

As the waste from sawmills and planing mills contains a certain value as fuel, it is customary to utilize as much of this waste as possible for power.

On account of the properties of this wood fuel a specially constructed furnace, or Dutch oven as it is usually called, is essential in order to obtain the most efficient combustion.

While it is not customary to make analyses of wood fuel in the same manner as coal, yet there is available data of heat value which are sufficient as there is no reason for making particular analyses of wood fuel because outside that purchased for domestic purposes it is usually burned as a waste product or refuse. It can be approximately stated, however, that about 2½ lbs. of wood are equal to 1 lb. of soft coal of ordinary quality. Further, equal weights of different woods have about the same heat value.

The moisture content will, of course, vary very greatly between different kinds of wood fuel. Kempe in his handbook states that every ten per cent. of moisture contained will reduce the heat value of the fuel ten per cent. The same authority gives the following table:

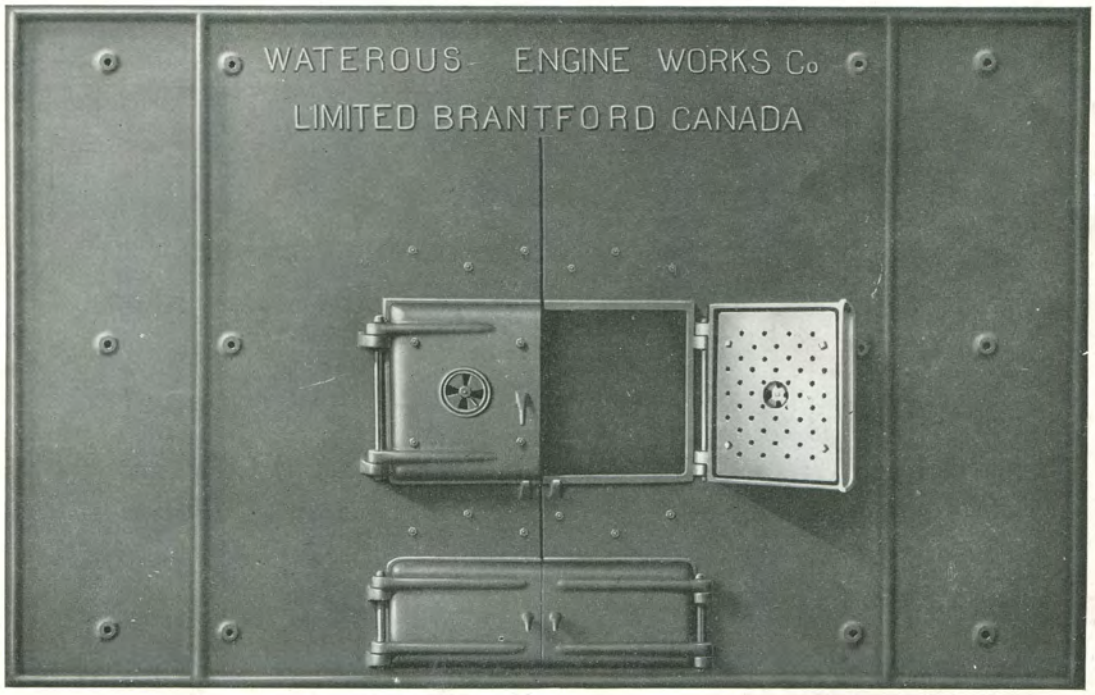
Wood	Wt. 1 cord lbs.	Average wt. of coal—lbs.
Hickory or Hard Maple	4500	2000
White Oak	3850	1715
Beech, Red Oak, Black Oak	3200	1450
Poplar, Chestnut and Elm	2350	1050
Average Pine	2000	925

In view of the above it is necessary to figure on a considerably larger grate surface per horse power than when burning coal. Also a larger stack is necessary for wood refuse. Not only should the stack be of larger

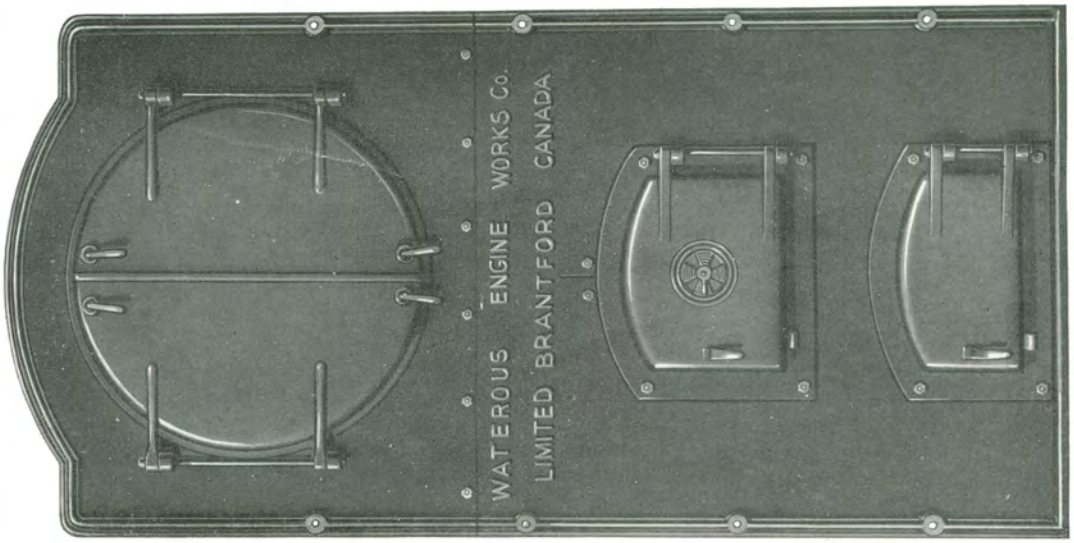
diameter but should have an ample height, especially in sawmills situated near the ocean, as the heavy, foggy weather of late fall and early winter makes it very difficult to steam unless the stack has sufficient height.

In logs coming from salt water a good deal of the salt is absorbed so that when the bark and refuse is burned a sort of slag is formed. This slag must be sliced in order to be removed.

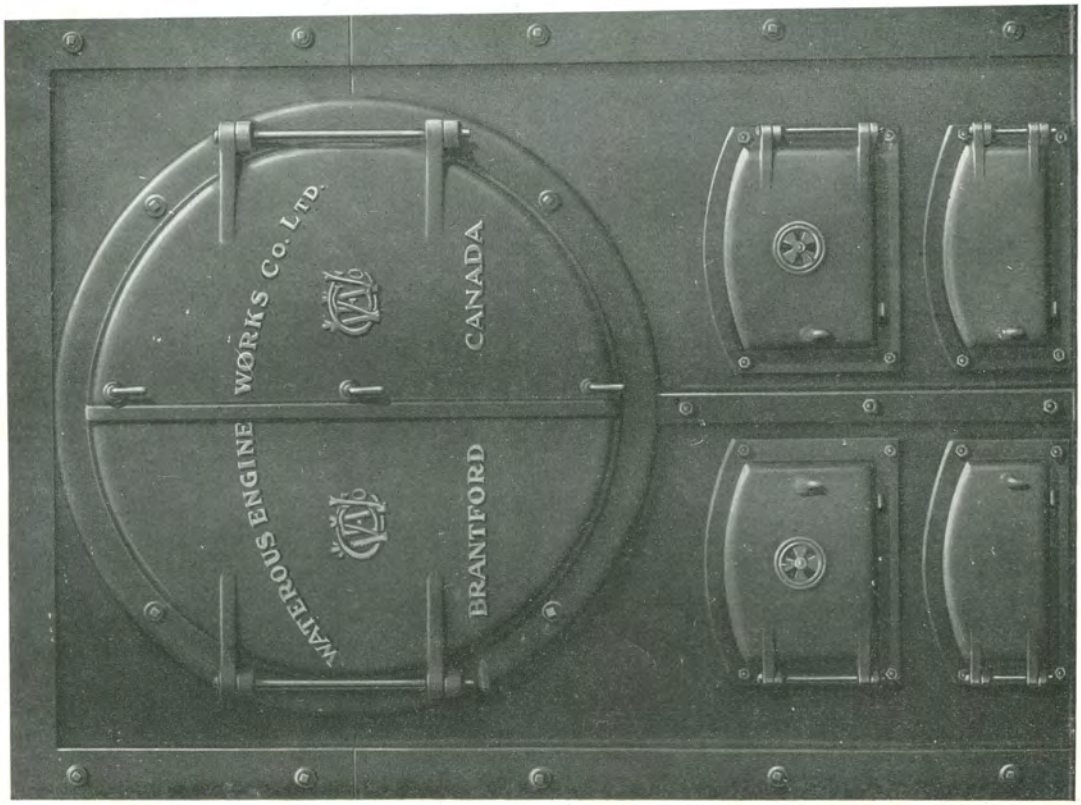
From our fifty years' sawmill experience we have designed Dutch ovens for practically every kind of wood fuel. We are therefore in a position to design a boiler setting and Dutch oven for obtaining the most efficient combustion of your fuel.



LOWER FRONT FOR DUTCH OVEN SETTINGS



For 36 and 42 in. Boilers.

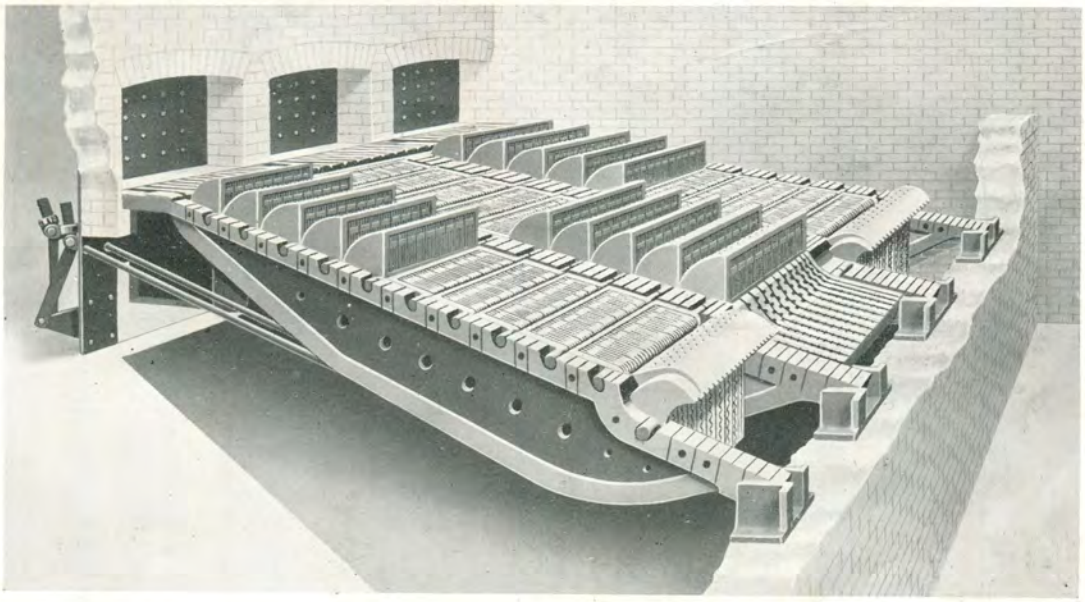


For 48 in. Boilers and Larger.

WATEROUS STANDARD FULL FRONTS

THE FILES STOKER

HAND OPERATED



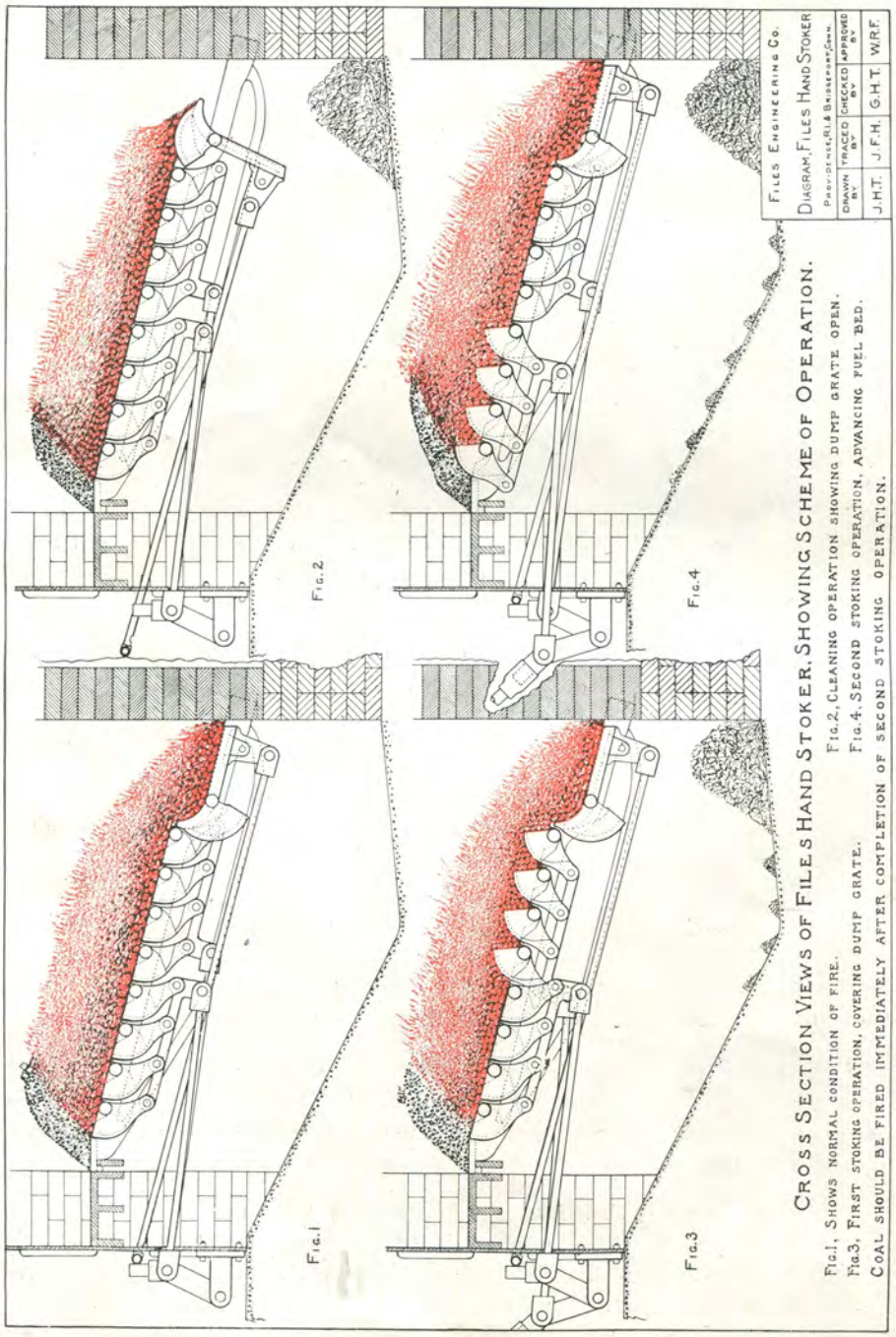
FILES STOKERS vs. HAND FIRING

The requirements for complete and efficient combustion are identical regardless of the equipment used; viz.: a correct proportion and distribution of air; a clean fire continuously maintained; and an even thickness of fuel bed in proportion to draft conditions and load.

ORDINARY HAND FIRING AND CLEANING

With ordinary hand firing on flat or shaking grates it is impossible to continuously preserve all of these conditions. A skilled fireman, by trimming the fire, can approximate these requirements when the fire is clean, but he cannot maintain them for any length of time.

As he continues to fire, the ash and clinker accumulate until there is a heavy bed of ash and a thin, uneven bed of coal. Thin spots in the fire will rapidly burn away—holes will develop and the fireman will be obliged to constantly use a hoe to level the fire and fill the holes. As this continues, the slice bar must be used with greater frequency to open up the fire, until it eventually becomes necessary to again clean the entire fire.



Cross Section Views of Files Hand Stoker, Showing Scheme of Operation.

Fig. 1, Shows normal condition of fire.
Fig. 2, Cleaning operation showing dump grate open.
Fig. 3, First stoking operation, covering dump grate.
Fig. 4, Second stoking operation, advancing fuel bed.
Coal should be fired immediately after completion of second stoking operation.

DISADVANTAGES OF THIS CLEANING OPERATION

This method of cleaning is not only very severe and disagreeable, but requires several minutes' time, during which the boiler is cut out of service, while large inrushes of cold air quickly cool the boiler and settings and in due time work serious injury to them by the sudden and excessive changes in temperatures.

AIR CIRCULATION

To obtain maximum efficiency, it is essential that the air supplied to the fire be uniformly distributed in correct proportion to the rate of combustion. When the fires are clean and of equal thickness, it is possible to obtain proper distribution of the air—but as fires build up, holes develop, and the fire doors are frequently opened to break up the fires, with the result that there is constantly varying supply of air which will alternately result in either too much air or too little air being used.

Excess air is detrimental to combustion efficiency. It does not form part of the products of combustion, while it must be heated to the temperature of the escaping gases and carries away a large percentage of the heat developed.

Too little air results in incomplete combustion, as sufficient oxygen is not available to completely burn the gases. The loss resulting from such conditions may range as high as 66-2/3% of the available heat units.

If the fire doors are continuously kept closed (as with Files Stokers), a balanced air supply may be maintained; but this is practically impossible with ordinary hand operation.

OPERATION OF THE FILES HAND STOKER

The irregular and unsatisfactory conditions cited are completely disposed of through the use of the Files Hand Stoker.

The stoker is of the overfeed type and the fire is under observation at all times. Coal is coked on two or three of the first stoker bars, where the gases are driven off and properly consumed in their passage over the hot, incandescent fire bed.

The coked coal is gradually worked down the inclined surface of the stoker by the simple operation of the stoker bar handles situated at the boiler front. This operation actuates the stoker bars vertically six inches into the fire, breaking up the ash and clinker formation and pushing it forward to the cleaning plate, at the same time advancing the unburned fuel toward the rear of the furnace and producing a condition whereby a free passage of air is obtainable throughout the entire fuel bed.

OPERATION OF THE FILES HAND STOKER—Continued

A single pull of the counterbalanced cleaning plate drops the ash into the ashpit without the loss of unburned coal or drop in steam pressure, and without entailing the extreme exertion on the part of the fireman required in cleaning the ordinary flat grate fire. This latter operation, necessary only at occasional intervals, is easily and instantly performed.

The result is a test fire condition at all times—free of ash and clinker, producing the highest and most efficient combustion to be desired.

INSTALLATION

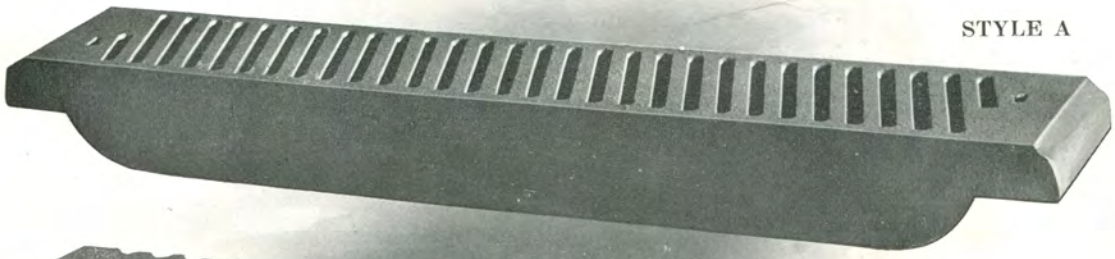
Files Hand Stokers can be easily installed at slight cost in a few days or over a week-end. No alterations to boiler fronts are necessary other than drilling a few holes for positioning the operating levers, and when complete there are no changes in settings or objectionable projections and the boiler fronts are not defaced.

Supports: The stokers are supported in front by a cross bearing bar which is fitted into boxes set into the side walls. The rear end of the bearing bars slide on expansion blocks set into the bridge wall. These hold the stoker rigidly in position but allow plenty of opportunity for expansion.

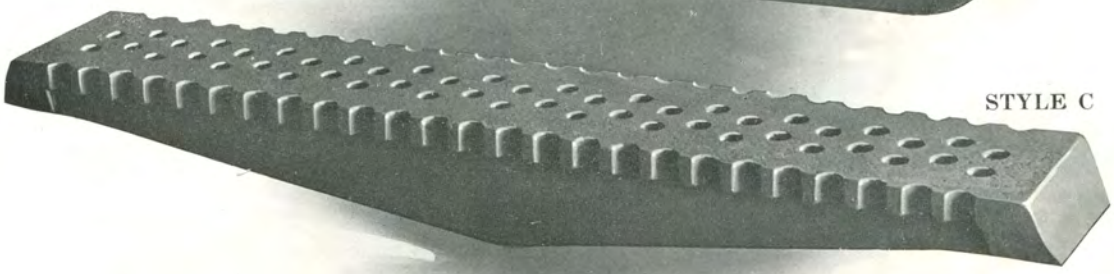
Ashpits: Any type of ashpit common in mechanical stokers installations, which will facilitate the removal of the ash, may be used.

Arches: Very often, in the case of a low setting, it is advisable to install a combustion arch over the front of the stoker, which will tend to eliminate smoke, and, by deflecting the gases back over the incandescent fire, intensify the combustion. This is especially necessary in some sections where high volatile coal must be used.

WATEROUS STANDARD BOILER GRATES



STYLE A

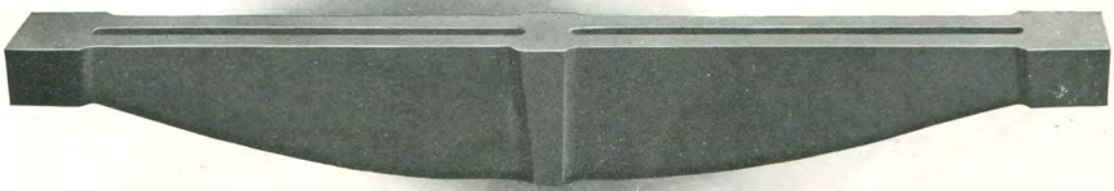


STYLE C

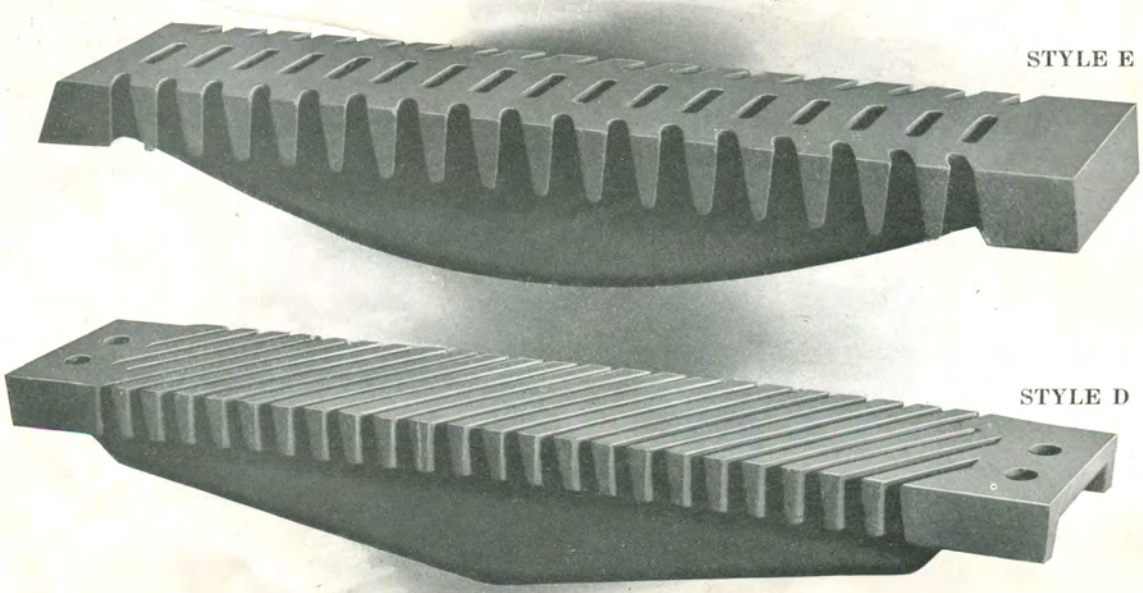
Style "A," our Standard Coal Grate, is supplied for all coal burning settings unless special forms are specified. The grate is of good design, sturdy, well built, and easy to keep clean.

Style "C" Sawdust Grate. The holes in this grate are tapered from top to bottom to permit a ready discharge of ashes to the pit. A heavy central rib gives the bar the necessary strength.

STYLE B



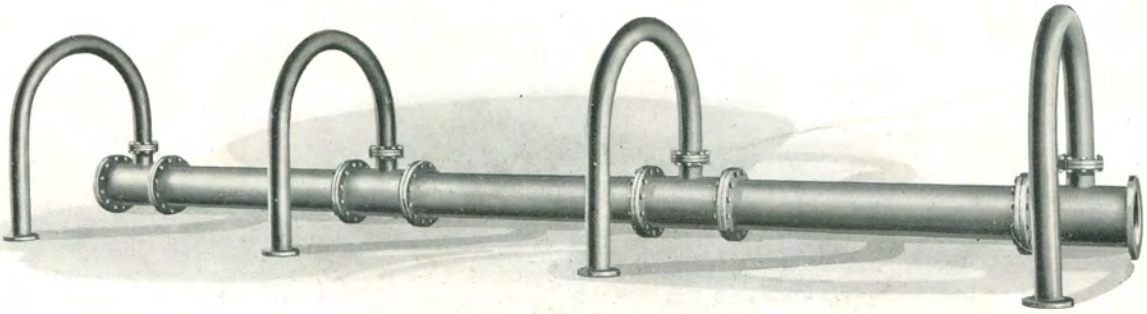
Style "B." This is our Standard Wood Grate. We supply it in all sizes, and can guarantee it for clean sanitary combustion.



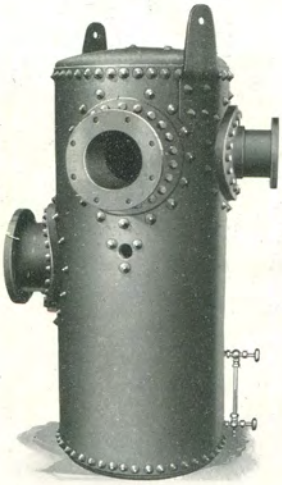
The Style "E" Sawdust Grate is generally supplied for Coast and B. C. use. It is a particularly solid, well-built grate and will give good satisfaction.

The Style "D" Improved Sawdust Grate. This grate combines a large air space with plenty of stiffness. It is strengthened by double rib, the cross pieces being of comfortable depth and bevelled from top to under side to shed ashes freely.

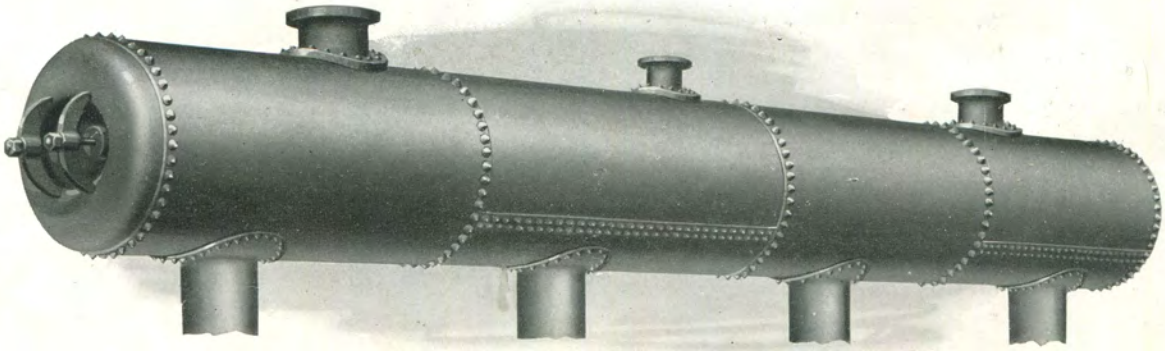
STEAM SPECIALTIES



CAST IRON HEADER

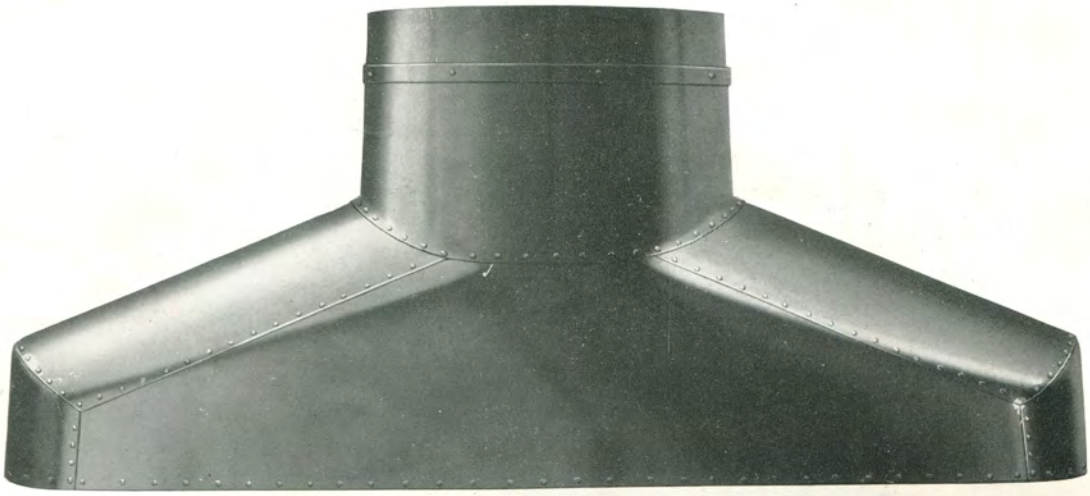


STEAM SEPARATOR

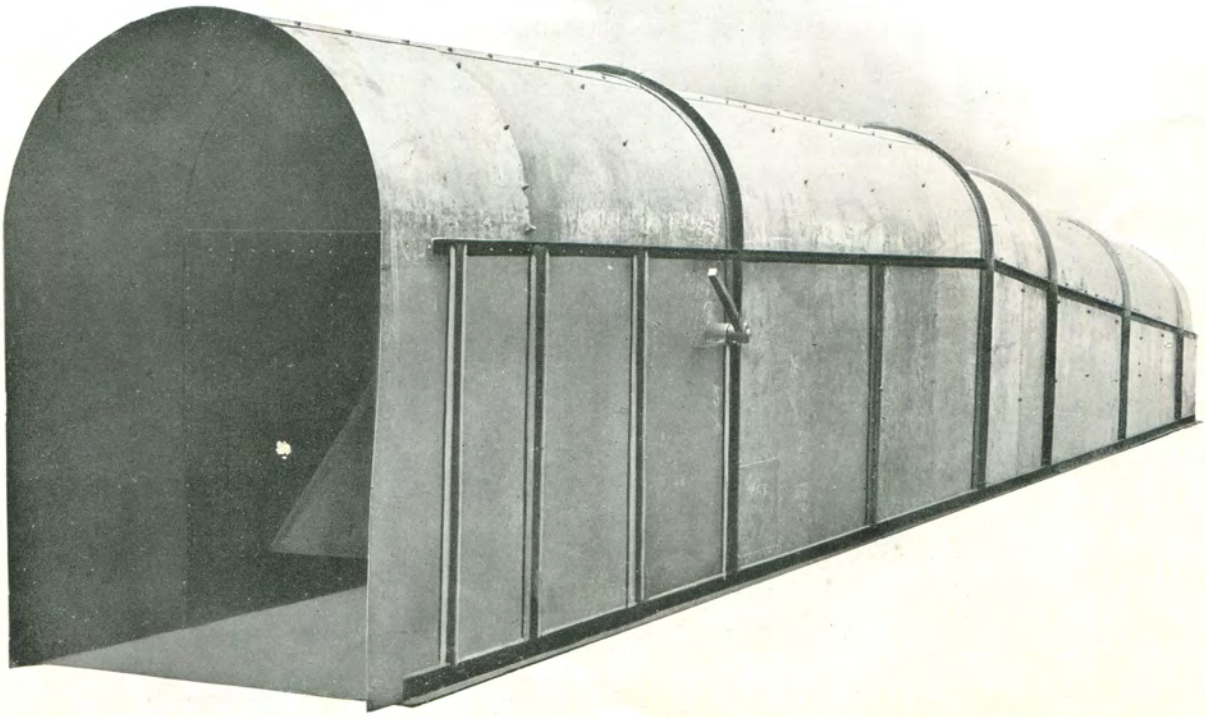


STEEL PLATE HEADER

WATEROUS BOILER BREECHINGS

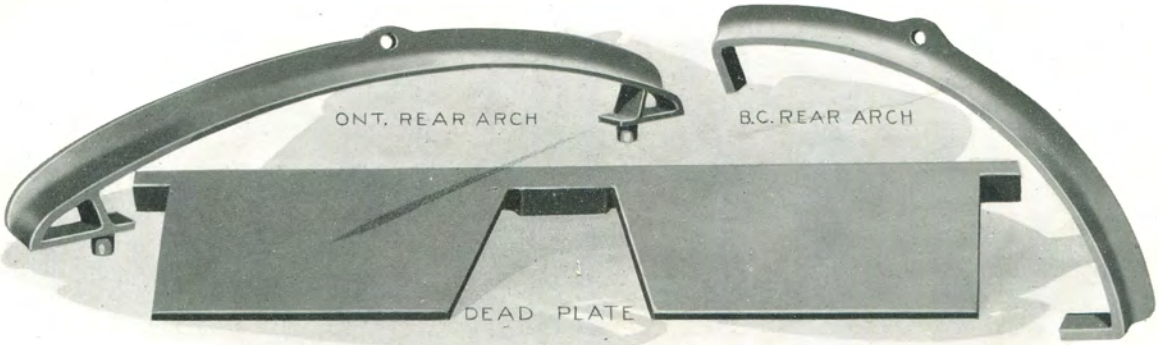


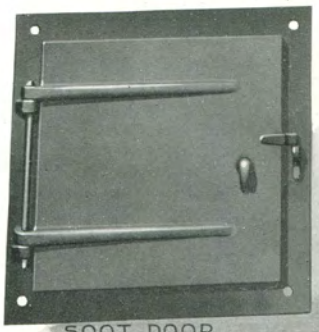
STANDARD BREECHING FOR TWO BOILERS

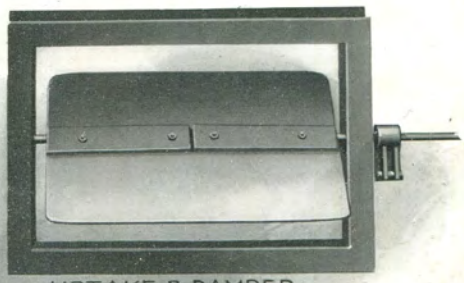


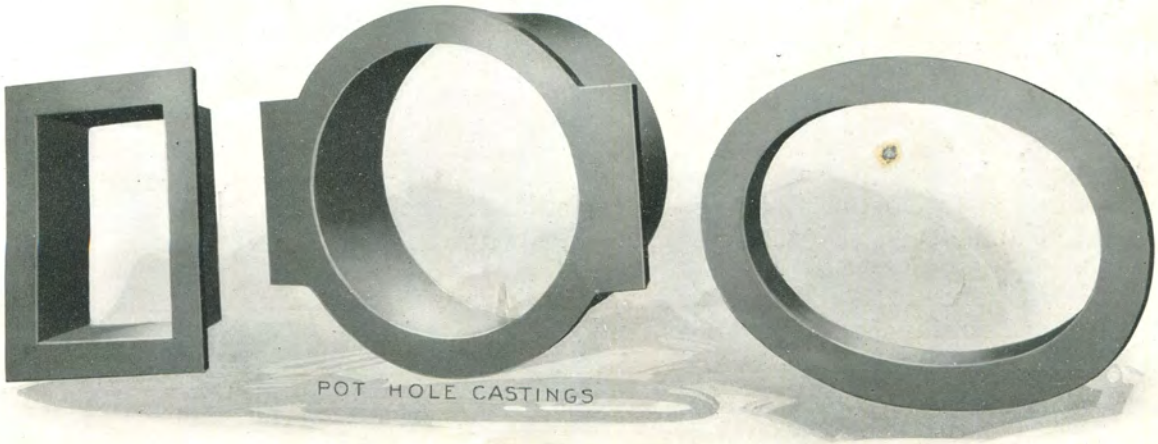
STANDARD BREECHING FOR THREE OR MORE BOILERS

WATEROUS BOILER CASTINGS

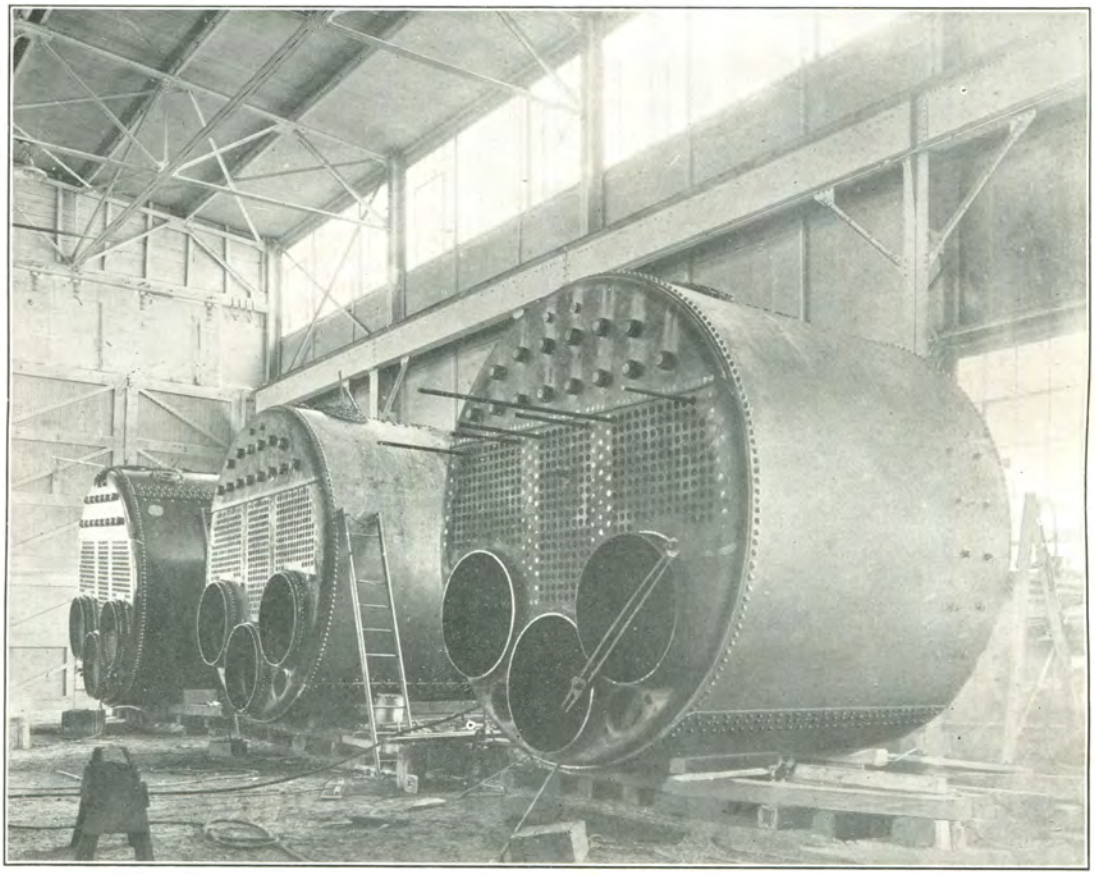



SOOT DOOR


UPTAKE & DAMPER


POT HOLE CASTINGS

WATEROUS MARINE BOILERS



The above cut shows part of an order for Scotch Marine Boilers 13 ft. 6 in. in diameter by 11 ft. 3 in. long, built for the American Naval Service.

The recent additions to our boiler shops with the installation of new and most modern equipment have put us in a better position than ever to handle large marine boilers and heavy steel plate work efficiently and economically.

WALKER PRESS LIMITED
PARIS, ONTARIO